



Triakis Corporation

System Test Document

For the

Shuttle Remote Manipulator System

**A NASA CI03
SARP Initiative 583
IVV-70 Project**



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1 Introduction

This specification is being developed to support a research project funded by the NASA Software Assurance Research Program (SARP) during the fiscal year 2003 Center Initiatives (CI03) effort. A system-level, executable specification (ES) based simulation of the Shuttle Remote Manipulator System (SRMS) has been created from the requirements specified in the System Requirements (SARP-I583-001) and Simulator Requirements (SARP-I583-002) Specifications, and will be used as a vehicle for exploring the concepts described in section 2 of Triakis proposal number TC_G020614.

This document provides the results of the tests used verify the specified SRMS behavior. Rather than a detailed description, this document essentially comprises the test result files produced as a result of running the ES and DE simulators. This document also presents the results of metrics gathered on the executable software produced while running the DE simulator. Discussion of the test results can be found in the final report for this project.

The same tests developed to verify the system requirements are also used to verify the executable software running in the DE. The tests are presented in the System Test Design Document (SARP-I583-205). This research effort does not require complete test coverage in order to achieve the stated goals and correspondingly, only a subset of the requirements has been tested. The metric results given in this document will, therefore, show incomplete code test coverage.

1.1 Purpose

The purpose of the virtual system being tested is to facilitate the research goals stated in Triakis proposal number TC_G020614. System components and functions of the real-world SRMS that are not required to support our research goals have been omitted. Please refer to the System Requirements Specification (SARP-I583-001) for a detailed explanation of the project purpose.

1.2 References

- SARP-I583-001 System Requirements Specification for the Shuttle Remote Manipulator System
- SARP-I583-002 Simulator Requirements Specification for the Shuttle Remote Manipulator System
- SARP-I583-205 System Test Design Document for the Shuttle Remote Manipulator System
- TC_G020614 Triakis proposal to NASA for the SARP (Solicitation No: NRA SARP 0201), 14 June 2002

2 Test Programs

Testing of the SRMS in the simulator is accomplished through the use of two individual executable test programs: Auto.cpp and SystemReqTest.cpp. The Auto.cpp file is run automatically upon completion of loading and running the simulator. The following sections describe the purpose and use of these two programs for testing in the simulator environment.

The Auto.cpp automatic test program is used as the entry point for testing the simulator. Typically, this program will set up the initial conditions for the simulator and then call one or more functions to perform the desired tests (e.g. system requirements tests, software requirements tests, etc.). In a case such as this project where there is first an ES and then a DE substitution, two different Auto.cpp programs are created. While the ES version is concerned primarily with running the requirements tests, the DE version is also concerned with lower level tests and gathering metrics on the software execution. The ES and DE Auto.cpp test files are documented along with the system requirements tests in the System Test Design Document (SARP-I583-205). Note that both the ES and DE auto test files call the same, unmodified SystemRequirementsTest() function.



2.1 ES Requirements Test Results

As discussed in the previous section, the ES version of the Auto.cpp program simply sets up the SRMS initial conditions and calls the SystemRequirementsTest() function (in SystemReqTest.cpp file). The complete list of ES system requirements test results (file name SysReqTest.res) can be found in Table 1.

As you can see, the ES passes all but two (test numbers 43 & 44) of the 131 requirements tests written. As it turns out there is a problem with the simulator that causes the upper arm strain gauge data module to be unresponsive to AFDX commands. Rather than fixing the problem, we felt it might be more instructive to show a failure in the tests rather than an “All Tests Passed” status.

Table 1: ES System Requirements Test Results

ES System Requirements Test Results	

*	AFDX Device Fault Reporting & Auto Clearing Tests

 Test Number 1: Shoulder Yaw Motor Fault - SET **** PASSED	
 Test Number 2: Shoulder Yaw Motor Fault - CLEAR **** PASSED	
 Test Number 3: Shoulder Pitch Motor Fault - SET **** PASSED	
 Test Number 4: Shoulder Pitch Motor Fault - CLEAR **** PASSED	
 Test Number 5: Elbow Pitch Motor Fault - SET **** PASSED	
 Test Number 6: Elbow Pitch Motor Fault - CLEAR **** PASSED	
 Test Number 7: Wrist Pitch Motor Fault - SET **** PASSED	
 Test Number 8: Wrist Pitch Motor Fault - CLEAR **** PASSED	
 Test Number 9: Wrist Yaw Motor Fault - SET **** PASSED	
 Test Number 10: Wrist Yaw Motor Fault - CLEAR **** PASSED	
 Test Number 11: Wrist Roll Motor Fault - SET	



ES System Requirements Test Results

**** PASSED

Test Number 12: Wrist Roll Motor Fault - CLEAR

**** PASSED

Test Number 13: Fwd Bay Cam Pitch Motor Fault - SET

**** PASSED

Test Number 14: Fwd Bay Cam Pitch Motor Fault - CLEAR

**** PASSED

Test Number 15: Fwd Bay Cam Yaw Motor Fault - SET

**** PASSED

Test Number 16: Fwd Bay Cam Yaw Motor Fault - CLEAR

**** PASSED

Test Number 17: Fwd Bay Cam Zoom Motor Fault - SET

**** PASSED

Test Number 18: Fwd Bay Cam Zoom Motor Fault - CLEAR

**** PASSED

Test Number 19: Aft Bay Cam Pitch Motor Fault - SET

**** PASSED

Test Number 20: Aft Bay Cam Pitch Motor Fault - CLEAR

**** PASSED

Test Number 21: Aft Bay Cam Yaw Motor Fault - SET

**** PASSED

Test Number 22: Aft Bay Cam Yaw Motor Fault - CLEAR

**** PASSED

Test Number 23: Aft Bay Cam Zoom Motor Fault - SET

**** PASSED

Test Number 24: Aft Bay Cam Zoom Motor Fault - CLEAR

**** PASSED

Test Number 25: UA Cam Pitch Motor Fault - SET

**** PASSED

Test Number 26: UA Cam Pitch Motor Fault - CLEAR

**** PASSED

Test Number 27: UA Cam Yaw Motor Fault - SET

**** PASSED

Test Number 28: UA Cam Yaw Motor Fault - CLEAR

**** PASSED



ES System Requirements Test Results

Test Number 29: UA Cam Zoom Motor Fault - SET
**** PASSED

Test Number 30: UA Cam Zoom Motor Fault - CLEAR
**** PASSED

Test Number 31: LA Cam Pitch Motor Fault - SET
**** PASSED

Test Number 32: LA Cam Pitch Motor Fault - CLEAR
**** PASSED

Test Number 33: LA Cam Yaw Motor Fault - SET
**** PASSED

Test Number 34: LA Cam Yaw Motor Fault - CLEAR
**** PASSED

Test Number 35: LA Cam Zoom Motor Fault - SET
**** PASSED

Test Number 36: LA Cam Zoom Motor Fault - CLEAR
**** PASSED

Test Number 37: Wrist Cam Pitch Motor Fault - SET
**** PASSED

Test Number 38: Wrist Cam Pitch Motor Fault - CLEAR
**** PASSED

Test Number 39: Wrist Cam Yaw Motor Fault - SET
**** PASSED

Test Number 40: Wrist Cam Yaw Motor Fault - CLEAR
**** PASSED

Test Number 41: Wrist Cam Zoom Motor Fault - SET
**** PASSED

Test Number 42: Wrist Cam Zoom Motor Fault - CLEAR
**** PASSED

Test Number 43: Upper Arm Strain Gauge Data Module Fault - SET

**** FAILED ****

Test Number 44: Upper Arm Strain Gauge Data Module Fault - CLEAR

**** FAILED ****

Test Number 45: Lower Arm Strain Gauge Data Module Fault - SET



ES System Requirements Test Results

**** PASSED

Test Number 46: Lower Arm Strain Gauge Data Module Fault - CLEAR

**** PASSED

Test Number 47: Fwd Bay Camera image sensor Fault - SET

**** PASSED

Test Number 48: Fwd Bay Camera image sensor Fault - CLEAR

**** PASSED

Test Number 49: Aft Bay Camera image sensor Fault - SET

**** PASSED

Test Number 50: Aft Bay Camera image sensor Fault - CLEAR

**** PASSED

Test Number 51: UA Camera image sensor Fault - SET

**** PASSED

Test Number 52: UA Camera image sensor Fault - CLEAR

**** PASSED

Test Number 53: LA Camera image sensor Fault - SET

**** PASSED

Test Number 54: LA Camera image sensor Fault - CLEAR

**** PASSED

Test Number 55: Wrist Camera image sensor Fault - SET

**** PASSED

Test Number 56: Wrist Camera image sensor Fault - CLEAR

**** PASSED

* RMA Joint Control Tests *

Testing Shoulder Yaw Control

Test Number 57: Positive Velocity

Actual value: 6.863508

Display value: 7.023682

Expected value: 7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Verify Display Value

**** PASSED



ES System Requirements Test Results

Test Number 58: Zero Velocity

Actual value: -0.060403

Display value: 0.000000

Expected value: 0.000000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Verify Display Value

**** PASSED

Test Number 59: Negative Velocity

Actual value: -7.057633

Display value: -7.059570

Expected value: -7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Verify Display Value

**** PASSED

Test Number 60: Positive Angle Seek

Actual angle: 110.549479

Display angle: 110.553711

Expected angle: 111.038746

Error range: +- 2.500000

Verify Actual Angle

**** PASSED

Verify Display Angle

**** PASSED

Test Number 61: Negative Angle Seek

Actual angle: 91.890892

Display angle: 91.837158

Expected angle: 90.549479

Error range: +- 2.500000

Verify Actual Angle

**** PASSED

Verify Display Angle

**** PASSED

Testing Shoulder Pitch Control

Test Number 62: Positive Velocity

Actual value: 6.863508

Display value: 7.023682

Expected value: 7.200000

Error range: +- 2.000000



ES System Requirements Test Results

Verify Actual Value

**** PASSED

Verify Display Value

**** PASSED

Test Number 63: Zero Velocity

Actual value: -0.060403

Display value: 0.000000

Expected value: 0.000000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Verify Display Value

**** PASSED

Test Number 64: Negative Velocity

Actual value: -7.057633

Display value: -7.059570

Expected value: -7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Verify Display Value

**** PASSED

Test Number 65:Positive Angle Seek

Actual angle: 110.549479

Display angle: 110.550049

Expected angle: 111.038746

Error range: +- 2.500000

Verify Actual Angle

**** PASSED

Verify Display Angle

**** PASSED

Test Number 66: Negative Angle Seek

Actual angle: 91.890892

Display angle: 91.883789

Expected angle: 90.549479

Error range: +- 2.500000

Verify Actual Angle

**** PASSED

Verify Display Angle

**** PASSED

Testing Elbow Pitch Control

Test Number 67: Positive Velocity



ES System Requirements Test Results

Actual value: 6.863508

Display value: 7.023682

Expected value: 7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Verify Display Value

**** PASSED

Test Number 68: Zero Velocity

Actual value: -0.060403

Display value: 0.000000

Expected value: 0.000000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Verify Display Value

**** PASSED

Test Number 69: Negative Velocity

Actual value: -7.057633

Display value: -7.059570

Expected value: -7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Verify Display Value

**** PASSED

Test Number 70:Positive Angle Seek

Actual angle: 110.549479

Display angle: 110.552490

Expected angle: 111.038746

Error range: +- 2.500000

Verify Actual Angle

**** PASSED

Verify Display Angle

**** PASSED

Test Number 71: Negative Angle Seek

Actual angle: 91.890892

Display angle: 91.853516

Expected angle: 90.549479

Error range: +- 2.500000

Verify Actual Angle

**** PASSED

Verify Display Angle

**** PASSED



ES System Requirements Test Results

Testing Wrist Pitch Control

Test Number 72: Positive Velocity

Actual value: 6.863508

Display value: 7.023682

Expected value: 7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Verify Display Value

**** PASSED

Test Number 73: Zero Velocity

Actual value: -0.060403

Display value: 0.000000

Expected value: 0.000000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Verify Display Value

**** PASSED

Test Number 74: Negative Velocity

Actual value: -7.057633

Display value: -7.059570

Expected value: -7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Verify Display Value

**** PASSED

Test Number 75:Positive Angle Seek

Actual angle: 110.549479

Display angle: 110.555176

Expected angle: 111.038746

Error range: +- 2.500000

Verify Actual Angle

**** PASSED

Verify Display Angle

**** PASSED

Test Number 76: Negative Angle Seek

Actual angle: 91.890892

Display angle: 91.819824

Expected angle: 90.549479

Error range: +- 2.500000

Verify Actual Angle

**** PASSED

Verify Display Angle

**** PASSED



ES System Requirements Test Results

Testing Wrist Yaw Control

Test Number 77: Positive Velocity

Actual value: 6.863508

Display value: 7.023682

Expected value: 7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Verify Display Value

**** PASSED

Test Number 78: Zero Velocity

Actual value: -0.060403

Display value: 0.000000

Expected value: 0.000000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Verify Display Value

**** PASSED

Test Number 79: Negative Velocity

Actual value: -7.057633

Display value: -7.059570

Expected value: -7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Verify Display Value

**** PASSED

Test Number 80:Positive Angle Seek

Actual angle: 110.549479

Display angle: 110.551270

Expected angle: 111.038746

Error range: +- 2.500000

Verify Actual Angle

**** PASSED

Verify Display Angle

**** PASSED

Test Number 81: Negative Angle Seek

Actual angle: 91.890892

Display angle: 91.868896

Expected angle: 90.549479

Error range: +- 2.500000



ES System Requirements Test Results

Verify Actual Angle

**** PASSED

Verify Display Angle

**** PASSED

Testing Wrist Roll Control

Test Number 82: Positive Velocity

Actual value: 6.863508

Display value: 7.023682

Expected value: 7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Verify Display Value

**** PASSED

Test Number 83: Zero Velocity

Actual value: -0.060403

Display value: 0.000000

Expected value: 0.000000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Verify Display Value

**** PASSED

Test Number 84: Negative Velocity

Actual value: -7.057633

Display value: -7.059570

Expected value: -7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Verify Display Value

**** PASSED

Test Number 85:Positive Angle Seek

Actual angle: 110.549479

Display angle: 110.553711

Expected angle: 111.038746

Error range: +- 2.500000

Verify Actual Angle

**** PASSED

Verify Display Angle

**** PASSED

Test Number 86: Negative Angle Seek



ES System Requirements Test Results

Actual angle: 91.890892

Display angle: 91.837158

Expected angle: 90.549479

Error range: +- 2.500000

Verify Actual Angle

**** PASSED

Verify Display Angle

**** PASSED

* Camera Motor Control Tests *

Testing UpperArmCam Yaw Control

Test Number 87: Positive Velocity

Actual value: 6.870123

Expected value: 7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 88: Zero Velocity

Actual value: 0.087262

Expected value: 0.000000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 89: Negative Velocity

Actual value: -6.921116

Expected value: -7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Testing UpperArmCam Pitch Control

Test Number 90: Positive Velocity

Actual value: 6.870123

Expected value: 7.200000

Error range: +- 2.000000



ES System Requirements Test Results

Verify Actual Value

**** PASSED

Test Number 91: Zero Velocity

Actual value: 0.087262

Expected value: 0.000000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 92: Negative Velocity

Actual value: -6.921116

Expected value: -7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Testing UpperArmCam Zoom Control

Test Number 93: Positive Velocity

Actual value: 6.870123

Expected value: 7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 94: Zero Velocity

Actual value: 0.087262

Expected value: 0.000000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 95: Negative Velocity

Actual value: -6.921116

Expected value: -7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Testing LowerArmCam Yaw Control

Test Number 96: Positive Velocity

Actual value: 6.870123



ES System Requirements Test Results

Expected value: 7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 97: Zero Velocity

Actual value: 0.087262

Expected value: 0.000000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 98: Negative Velocity

Actual value: -6.921116

Expected value: -7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Testing LowerArmCam Pitch Control

Test Number 99: Positive Velocity

Actual value: 6.870123

Expected value: 7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 100: Zero Velocity

Actual value: 0.087262

Expected value: 0.000000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 101: Negative Velocity

Actual value: -6.921116

Expected value: -7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Testing LowerArmCam Zoom Control



ES System Requirements Test Results

Test Number 102: Positive Velocity

Actual value: 6.870123

Expected value: 7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 103: Zero Velocity

Actual value: 0.087262

Expected value: 0.000000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 104: Negative Velocity

Actual value: -6.921116

Expected value: -7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Testing WristCam Yaw Control

Test Number 105: Positive Velocity

Actual value: 6.870123

Expected value: 7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 106: Zero Velocity

Actual value: 0.087262

Expected value: 0.000000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 107: Negative Velocity

Actual value: -6.921116

Expected value: -7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Testing WristCam Pitch Control



ES System Requirements Test Results

Test Number 108: Positive Velocity

Actual value: 6.870123

Expected value: 7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 109: Zero Velocity

Actual value: 0.087262

Expected value: 0.000000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 110: Negative Velocity

Actual value: -6.921116

Expected value: -7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Testing WristCam Zoom Control

Test Number 111: Positive Velocity

Actual value: 6.870123

Expected value: 7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 112: Zero Velocity

Actual value: 0.087262

Expected value: 0.000000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 113: Negative Velocity

Actual value: -6.921116

Expected value: -7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED



ES System Requirements Test Results

Testing FwdBayCam Yaw Control

Test Number 114: Positive Velocity

Actual value: 6.870123

Expected value: 7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 115: Zero Velocity

Actual value: 0.087262

Expected value: 0.000000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 116: Negative Velocity

Actual value: -6.921116

Expected value: -7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Testing FwdBayCam Pitch Control

Test Number 117: Positive Velocity

Actual value: 6.870123

Expected value: 7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 118: Zero Velocity

Actual value: 0.087262

Expected value: 0.000000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 119: Negative Velocity

Actual value: -6.921116

Expected value: -7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED



ES System Requirements Test Results

Testing FwdBayCam Zoom Control

Test Number 120: Positive Velocity

Actual value: 6.870123

Expected value: 7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 121: Zero Velocity

Actual value: 0.087262

Expected value: 0.000000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 122: Negative Velocity

Actual value: -6.921116

Expected value: -7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Testing AftBayCam Yaw Control

Test Number 123: Positive Velocity

Actual value: 6.870123

Expected value: 7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 124: Zero Velocity

Actual value: 0.087262

Expected value: 0.000000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 125: Negative Velocity

Actual value: -6.921116

Expected value: -7.200000

Error range: +- 2.000000

Verify Actual Value



ES System Requirements Test Results

**** PASSED

Testing AftBayCam Pitch Control

Test Number 126: Positive Velocity

Actual value: 6.870123

Expected value: 7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 127: Zero Velocity

Actual value: 0.087262

Expected value: 0.000000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 128: Negative Velocity

Actual value: -6.921116

Expected value: -7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Testing AftBayCam Zoom Control

Test Number 129: Positive Velocity

Actual value: 6.870123

Expected value: 7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 130: Zero Velocity

Actual value: 0.087262

Expected value: 0.000000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 131: Negative Velocity

Actual value: -6.921116

Expected value: -7.200000



ES System Requirements Test Results

Error range: +- 2.000000

Verify Actual Value

**** PASSED

2.2 DE Requirements Test Results

The complete list of ES system requirements test results (file name SysReqTest.res) can be found in Table 2. As with the ES, the DE passes all but two (test numbers 43 & 44) of the 131 requirements tests written.

Table 2: DE System Requirements Test Results

DE System Requirements Test Results

* AFDX Device Fault Reporting & Auto Clearing Tests *

Test Number 1: Shoulder Yaw Motor Fault - SET

**** PASSED

Test Number 2: Shoulder Yaw Motor Fault - CLEAR

**** PASSED

Test Number 3: Shoulder Pitch Motor Fault - SET

**** PASSED

Test Number 4: Shoulder Pitch Motor Fault - CLEAR

**** PASSED

Test Number 5: Elbow Pitch Motor Fault - SET

**** PASSED

Test Number 6: Elbow Pitch Motor Fault - CLEAR

**** PASSED

Test Number 7: Wrist Pitch Motor Fault - SET

**** PASSED

Test Number 8: Wrist Pitch Motor Fault - CLEAR

**** PASSED



DE System Requirements Test Results

Test Number 9: Wrist Yaw Motor Fault - SET

**** PASSED

Test Number 10: Wrist Yaw Motor Fault - CLEAR

**** PASSED

Test Number 11: Wrist Roll Motor Fault - SET

**** PASSED

Test Number 12: Wrist Roll Motor Fault - CLEAR

**** PASSED

Test Number 13: Fwd Bay Cam Pitch Motor Fault - SET

**** PASSED

Test Number 14: Fwd Bay Cam Pitch Motor Fault - CLEAR

**** PASSED

Test Number 15: Fwd Bay Cam Yaw Motor Fault - SET

**** PASSED

Test Number 16: Fwd Bay Cam Yaw Motor Fault - CLEAR

**** PASSED

Test Number 17: Fwd Bay Cam Zoom Motor Fault - SET

**** PASSED

Test Number 18: Fwd Bay Cam Zoom Motor Fault - CLEAR

**** PASSED

Test Number 19: Aft Bay Cam Pitch Motor Fault - SET

**** PASSED

Test Number 20: Aft Bay Cam Pitch Motor Fault - CLEAR

**** PASSED

Test Number 21: Aft Bay Cam Yaw Motor Fault - SET

**** PASSED

Test Number 22: Aft Bay Cam Yaw Motor Fault - CLEAR

**** PASSED

Test Number 23: Aft Bay Cam Zoom Motor Fault - SET

**** PASSED

Test Number 24: Aft Bay Cam Zoom Motor Fault - CLEAR

**** PASSED

Test Number 25: UA Cam Pitch Motor Fault - SET

**** PASSED

Test Number 26: UA Cam Pitch Motor Fault - CLEAR



DE System Requirements Test Results

**** PASSED

Test Number 27: UA Cam Yaw Motor Fault - SET

**** PASSED

Test Number 28: UA Cam Yaw Motor Fault - CLEAR

**** PASSED

Test Number 29: UA Cam Zoom Motor Fault - SET

**** PASSED

Test Number 30: UA Cam Zoom Motor Fault - CLEAR

**** PASSED

Test Number 31: LA Cam Pitch Motor Fault - SET

**** PASSED

Test Number 32: LA Cam Pitch Motor Fault - CLEAR

**** PASSED

Test Number 33: LA Cam Yaw Motor Fault - SET

**** PASSED

Test Number 34: LA Cam Yaw Motor Fault - CLEAR

**** PASSED

Test Number 35: LA Cam Zoom Motor Fault - SET

**** PASSED

Test Number 36: LA Cam Zoom Motor Fault - CLEAR

**** PASSED

Test Number 37: Wrist Cam Pitch Motor Fault - SET

**** PASSED

Test Number 38: Wrist Cam Pitch Motor Fault - CLEAR

**** PASSED

Test Number 39: Wrist Cam Yaw Motor Fault - SET

**** PASSED

Test Number 40: Wrist Cam Yaw Motor Fault - CLEAR

**** PASSED

Test Number 41: Wrist Cam Zoom Motor Fault - SET

**** PASSED

Test Number 42: Wrist Cam Zoom Motor Fault - CLEAR

**** PASSED

Test Number 43: Upper Arm Strain Gauge Data Module Fault - SET



DE System Requirements Test Results

**** FAILED ****

Test Number 44: Upper Arm Strain Gauge Data Module Fault - CLEAR

**** FAILED ****

Test Number 45: Lower Arm Strain Gauge Data Module Fault - SET

**** PASSED

Test Number 46: Lower Arm Strain Gauge Data Module Fault - CLEAR

**** PASSED

Test Number 47: Fwd Bay Camera image sensor Fault - SET

**** PASSED

Test Number 48: Fwd Bay Camera image sensor Fault - CLEAR

**** PASSED

Test Number 49: Aft Bay Camera image sensor Fault - SET

**** PASSED

Test Number 50: Aft Bay Camera image sensor Fault - CLEAR

**** PASSED

Test Number 51: UA Camera image sensor Fault - SET

**** PASSED

Test Number 52: UA Camera image sensor Fault - CLEAR

**** PASSED

Test Number 53: LA Camera image sensor Fault - SET

**** PASSED

Test Number 54: LA Camera image sensor Fault - CLEAR

**** PASSED

Test Number 55: Wrist Camera image sensor Fault - SET

**** PASSED

Test Number 56: Wrist Camera image sensor Fault - CLEAR

**** PASSED

* RMA Joint Control Tests *

Testing Shoulder Yaw Control

Test Number 57: Positive Velocity

Actual value: 6.863508



DE System Requirements Test Results

Display value: 7.023682

Expected value: 7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Verify Display Value

**** PASSED

Test Number 58: Zero Velocity

Actual value: -0.060403

Display value: 0.000000

Expected value: 0.000000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Verify Display Value

**** PASSED

Test Number 59: Negative Velocity

Actual value: -7.057633

Display value: -7.059570

Expected value: -7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Verify Display Value

**** PASSED

Test Number 60:Positive Angle Seek

Actual angle: 110.549479

Display angle: 110.553711

Expected angle: 111.038746

Error range: +- 2.500000

Verify Actual Angle

**** PASSED

Verify Display Angle

**** PASSED

Test Number 61: Negative Angle Seek

Actual angle: 91.890892

Display angle: 91.837158

Expected angle: 90.549479

Error range: +- 2.500000

Verify Actual Angle

**** PASSED

Verify Display Angle

**** PASSED

Testing Shoulder Pitch Control



DE System Requirements Test Results

Test Number 62: Positive Velocity

Actual value: 6.863508

Display value: 7.023682

Expected value: 7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Verify Display Value

**** PASSED

Test Number 63: Zero Velocity

Actual value: -0.060403

Display value: 0.000000

Expected value: 0.000000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Verify Display Value

**** PASSED

Test Number 64: Negative Velocity

Actual value: -7.057633

Display value: -7.059570

Expected value: -7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Verify Display Value

**** PASSED

Test Number 65:Positive Angle Seek

Actual angle: 110.549479

Display angle: 110.550049

Expected angle: 111.038746

Error range: +- 2.500000

Verify Actual Angle

**** PASSED

Verify Display Angle

**** PASSED

Test Number 66: Negative Angle Seek

Actual angle: 91.890892

Display angle: 91.883789

Expected angle: 90.549479

Error range: +- 2.500000

Verify Actual Angle

**** PASSED

Verify Display Angle

**** PASSED



DE System Requirements Test Results

Testing Elbow Pitch Control

Test Number 67: Positive Velocity

Actual value: 6.863508

Display value: 7.023682

Expected value: 7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Verify Display Value

**** PASSED

Test Number 68: Zero Velocity

Actual value: -0.060403

Display value: 0.000000

Expected value: 0.000000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Verify Display Value

**** PASSED

Test Number 69: Negative Velocity

Actual value: -7.057633

Display value: -7.059570

Expected value: -7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Verify Display Value

**** PASSED

Test Number 70:Positive Angle Seek

Actual angle: 110.549479

Display angle: 110.552490

Expected angle: 111.038746

Error range: +- 2.500000

Verify Actual Angle

**** PASSED

Verify Display Angle

**** PASSED

Test Number 71: Negative Angle Seek

Actual angle: 91.890892

Display angle: 91.853516

Expected angle: 90.549479

Error range: +- 2.500000

Verify Actual Angle



DE System Requirements Test Results

**** PASSED

Verify Display Angle

**** PASSED

Testing Wrist Pitch Control

Test Number 72: Positive Velocity

Actual value: 6.863508

Display value: 7.023682

Expected value: 7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Verify Display Value

**** PASSED

Test Number 73: Zero Velocity

Actual value: -0.060403

Display value: 0.000000

Expected value: 0.000000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Verify Display Value

**** PASSED

Test Number 74: Negative Velocity

Actual value: -7.057633

Display value: -7.059570

Expected value: -7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Verify Display Value

**** PASSED

Test Number 75:Positive Angle Seek

Actual angle: 110.549479

Display angle: 110.555176

Expected angle: 111.038746

Error range: +- 2.500000

Verify Actual Angle

**** PASSED

Verify Display Angle

**** PASSED

Test Number 76: Negative Angle Seek

Actual angle: 91.890892



DE System Requirements Test Results

Display angle: 91.819824

Expected angle: 90.549479

Error range: +- 2.500000

Verify Actual Angle

**** PASSED

Verify Display Angle

**** PASSED

Testing Wrist Yaw Control

Test Number 77: Positive Velocity

Actual value: 6.863508

Display value: 7.023682

Expected value: 7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Verify Display Value

**** PASSED

Test Number 78: Zero Velocity

Actual value: -0.060403

Display value: 0.000000

Expected value: 0.000000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Verify Display Value

**** PASSED

Test Number 79: Negative Velocity

Actual value: -7.057633

Display value: -7.059570

Expected value: -7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Verify Display Value

**** PASSED

Test Number 80:Positive Angle Seek

Actual angle: 110.549479

Display angle: 110.551270

Expected angle: 111.038746

Error range: +- 2.500000

Verify Actual Angle

**** PASSED

Verify Display Angle



DE System Requirements Test Results

**** PASSED

Test Number 81: Negative Angle Seek

Actual angle: 91.890892

Display angle: 91.868896

Expected angle: 90.549479

Error range: +- 2.500000

Verify Actual Angle

**** PASSED

Verify Display Angle

**** PASSED

Testing Wrist Roll Control

Test Number 82: Positive Velocity

Actual value: 6.863508

Display value: 7.023682

Expected value: 7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Verify Display Value

**** PASSED

Test Number 83: Zero Velocity

Actual value: -0.060403

Display value: 0.000000

Expected value: 0.000000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Verify Display Value

**** PASSED

Test Number 84: Negative Velocity

Actual value: -7.057633

Display value: -7.059570

Expected value: -7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Verify Display Value

**** PASSED

Test Number 85:Positive Angle Seek

Actual angle: 110.549479

Display angle: 110.553711

Expected angle: 111.038746



DE System Requirements Test Results

Error range: +- 2.500000

Verify Actual Angle

**** PASSED

Verify Display Angle

**** PASSED

Test Number 86: Negative Angle Seek

Actual angle: 91.890892

Display angle: 91.837158

Expected angle: 90.549479

Error range: +- 2.500000

Verify Actual Angle

**** PASSED

Verify Display Angle

**** PASSED

* Camera Motor Control Tests *

Testing UpperArmCam Yaw Control

Test Number 87: Positive Velocity

Actual value: 6.870123

Expected value: 7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 88: Zero Velocity

Actual value: 0.087262

Expected value: 0.000000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 89: Negative Velocity

Actual value: -6.921116

Expected value: -7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED



DE System Requirements Test Results

Testing UpperArmCam Pitch Control

Test Number 90: Positive Velocity

Actual value: 6.870123

Expected value: 7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 91: Zero Velocity

Actual value: 0.087262

Expected value: 0.000000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 92: Negative Velocity

Actual value: -6.921116

Expected value: -7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Testing UpperArmCam Zoom Control

Test Number 93: Positive Velocity

Actual value: 6.870123

Expected value: 7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 94: Zero Velocity

Actual value: 0.087262

Expected value: 0.000000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 95: Negative Velocity

Actual value: -6.921116

Expected value: -7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED



DE System Requirements Test Results

Testing LowerArmCam Yaw Control

Test Number 96: Positive Velocity

Actual value: 6.870123

Expected value: 7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 97: Zero Velocity

Actual value: 0.087262

Expected value: 0.000000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 98: Negative Velocity

Actual value: -6.921116

Expected value: -7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Testing LowerArmCam Pitch Control

Test Number 99: Positive Velocity

Actual value: 6.870123

Expected value: 7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 100: Zero Velocity

Actual value: 0.087262

Expected value: 0.000000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 101: Negative Velocity

Actual value: -6.921116

Expected value: -7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED



DE System Requirements Test Results

Testing LowerArmCam Zoom Control

Test Number 102: Positive Velocity

Actual value: 6.870123

Expected value: 7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 103: Zero Velocity

Actual value: 0.087262

Expected value: 0.000000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 104: Negative Velocity

Actual value: -6.921116

Expected value: -7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Testing WristCam Yaw Control

Test Number 105: Positive Velocity

Actual value: 6.870123

Expected value: 7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 106: Zero Velocity

Actual value: 0.087262

Expected value: 0.000000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 107: Negative Velocity

Actual value: -6.921116

Expected value: -7.200000

Error range: +- 2.000000



DE System Requirements Test Results

Verify Actual Value

**** PASSED

Testing WristCam Pitch Control

Test Number 108: Positive Velocity

Actual value: 6.870123

Expected value: 7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 109: Zero Velocity

Actual value: 0.087262

Expected value: 0.000000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 110: Negative Velocity

Actual value: -6.921116

Expected value: -7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Testing WristCam Zoom Control

Test Number 111: Positive Velocity

Actual value: 6.870123

Expected value: 7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 112: Zero Velocity

Actual value: 0.087262

Expected value: 0.000000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 113: Negative Velocity

Actual value: -6.921116



DE System Requirements Test Results

Expected value: -7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Testing FwdBayCam Yaw Control

Test Number 114: Positive Velocity

Actual value: 6.870123

Expected value: 7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 115: Zero Velocity

Actual value: 0.087262

Expected value: 0.000000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 116: Negative Velocity

Actual value: -6.921116

Expected value: -7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Testing FwdBayCam Pitch Control

Test Number 117: Positive Velocity

Actual value: 6.870123

Expected value: 7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 118: Zero Velocity

Actual value: 0.087262

Expected value: 0.000000

Error range: +- 2.000000

Verify Actual Value

**** PASSED



DE System Requirements Test Results

Test Number 119: Negative Velocity

Actual value: -6.921116

Expected value: -7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Testing FwdBayCam Zoom Control

Test Number 120: Positive Velocity

Actual value: 6.870123

Expected value: 7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 121: Zero Velocity

Actual value: 0.087262

Expected value: 0.000000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 122: Negative Velocity

Actual value: -6.921116

Expected value: -7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Testing AftBayCam Yaw Control

Test Number 123: Positive Velocity

Actual value: 6.870123

Expected value: 7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 124: Zero Velocity

Actual value: 0.087262

Expected value: 0.000000

Error range: +- 2.000000

Verify Actual Value



DE System Requirements Test Results

**** PASSED

Test Number 125: Negative Velocity

Actual value: -6.921116

Expected value: -7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Testing AftBayCam Pitch Control

Test Number 126: Positive Velocity

Actual value: 6.870123

Expected value: 7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 127: Zero Velocity

Actual value: 0.087262

Expected value: 0.000000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 128: Negative Velocity

Actual value: -6.921116

Expected value: -7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Testing AftBayCam Zoom Control

Test Number 129: Positive Velocity

Actual value: 6.870123

Expected value: 7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 130: Zero Velocity

Actual value: 0.087262

Expected value: 0.000000



DE System Requirements Test Results

Error range: +- 2.000000

Verify Actual Value

**** PASSED

Test Number 131: Negative Velocity

Actual value: -6.921116

Expected value: -7.200000

Error range: +- 2.000000

Verify Actual Value

**** PASSED

2.3 DE Software Execution Metrics Test Results

The following sections provide the results of the metrics gathered while running the DE under control of the auto-test program.

2.3.1 Software Path Coverage Metrics

This report shows all conditional jump (or call) assembly code instructions and whether a condition caused a jump or no jump (execution fell through to the following instruction) during execution. The test results shown in Table 3, are logged in the file JumpMarks.txt.

Table 3: Software Path Coverage Metrics

Software Path Coverage Metrics

Address	No Jump	Jump	Symbol	Offset
00002074	x	x	ExtInterruptHandler	+ 74 hex
00002084	x		ExtInterruptHandler	+ 84 hex
000020ac	x		pitint	+ 20 hex
000021b0	x		__user_startup_hook	+ 0 hex
0000220c	x		MIOSPWM::MIOSPWM(void)	+ 4c hex
000022b0	x	x	MIOSPWM::InitCold(void)	+ 94 hex
000022b8	x	x	MIOSPWM::InitCold(void)	+ 9c hex
00002388	x	x	MIOSPWM::InitCold(void)	+ 16c hex
000023c0	x		MIOSPWM::InitCold(void)	+ 1a4 hex
00002400	x		MIOSPWM::SetDutyCycle(int,unsigned)	+ 18 hex
0000241c	x		MIOSPWM::SetPeriod(int,unsigned)	+ 18 hex
00002494		x	QADC::QADC(unsigned)	+ 74 hex
000024f8	x		QADC::QADC(unsigned)	+ d8 hex
0000250c	x		QADC::PeriodicFunc(void)	+ 10 hex
00002560	x	x	QADC::PeriodicFunc(void)	+ 64 hex
0000257c	x		QADC::PeriodicFunc(void)	+ 80 hex
000025b0	x	x	QADC::Queue1_ISR(void)	+ 30 hex
00002610	x		QADC::Queue1_ISR(void)	+ 90 hex
0000273c	x		QADC::InitCold(void)	+ c4 hex
00002754	x		QADC::InitCold(void)	+ dc hex



```
0000286c      x      QADC::InitCold(void) + 1f4 hex
000028b8      x      x      ShortPeriodicTask::MeasDuration(int) + 24 hex
000028c4      x      ShortPeriodicTask::MeasDuration(int) + 30 hex
00002948      x      RealTimeObject::RealTimeObject(void) + 40 hex
000029d4      x      static + 18 hex
000029f4      x      x      static + 1c hex
00002a00      x      static + 28 hex
00002ab4      x      x
RealTimeObject::RegisterShortPeriodicTask(void(RealTimeObject::*)(void),int,int,int) + 5c hex
00002ae0      x
RealTimeObject::RegisterShortPeriodicTask(void(RealTimeObject::*)(void),int,int,int) + 88 hex
00002af4      x      RealTimeObject::ResetShortPeriodicTaskIterator(void) + 10 hex
00002b0c      x      x      RealTimeObject::GetNextSPTTask(void) + 14 hex
00002b1c      x      RealTimeObject::GetNextSPTTask(void) + 24 hex
00002b38      x      RealTimeObject::CallFunctionIndirect(void(RealTimeObject::*)(void)) + 18 hex
00002b48      x      RealTimeObject::CallFunctionIndirect(void(RealTimeObject::*)(void)) + 28 hex
00002b78      x      RealTimeObject::RegisterISRTask(void(RealTimeObject::*)(void),unsigned + 2c
hex
00002ba4      x      RealTimeControl::RealTimeControl(void) + 28 hex
00002c58      x      x      static + 60 hex
00002c74      x      x      static + 7c hex
00002c8c      x      static + 94 hex
00002ce0      x      static + e8 hex
00002d5c      x      static + 30 hex
00002d64      x      static + 38 hex
00002d74      x      static + 48 hex
00002d7c      x      x      static + 50 hex
00002dc0      x      static + 94 hex
00002dd4      x      static + a8 hex
00002e00      x      static + d4 hex
00002e3c      x      __mod_I_rtc0realtime_cpp_000 + 2c hex
00002e80      x      TimingMonitor::TimingMonitor(void) + 40 hex
00002ea8      x      TimingMonitor::SetBit(int) + 24 hex
00002ed0      x      TimingMonitor::ResetBit(int) + 24 hex
00002f2c      x      __mod_I_tm0timing_cpp_000 + 2c hex
00002f3c      x      x      InitCom(char) + c hex
00002f6c      x      InitCom(char) + 3c hex
00002f90      x      ClearWatchdog(void) + 20 hex
00002fac      x      ReadyToSend(char) + 18 hex
00002fc4      x      x      ReadyToSend(char) + 30 hex
00002fdc      x      ReadyToSend(char) + 48 hex
00003008      x      mon_putchar(unsigned + 28 hex
0000301c      x      mon_putchar(unsigned + 3c hex
00003044      x      mon_putchar(unsigned + 64 hex
0000305c      x      x      mon_putch(char) + 14 hex
00003088      x      mon_putch(char) + 40 hex
000030a4      x      x      mon_puts(char*) + 18 hex
000030c4      x      mon_puts(char*) + 38 hex
000030e0      x      SerialReady(char) + 18 hex
000030fc      x      SerialReady(char) + 34 hex
00003118      x      SerialReady(char) + 50 hex
000032d8      x      GetSByte(void) + 24 hex
000035cc      x      SendPrompt(void) + 28 hex
00003634      x      main + 64 hex
00003680      x      main + b0 hex
000036b8      x      main + e8 hex
000036f4      x      main + 124 hex
00003708      x      main + 138 hex
0000375c      x      main + 18c hex
00003770      x      main + 1a0 hex
000037bc      x      main + 1ec hex
00003910      x      main + 340 hex
00003944      x      main + 374 hex
0000408c      x      StartInterrupts(void) + 70 hex
000040d0      x      ShortPeriodicInt + 1c hex
000040f0      x      HandleISR + 1c hex
00004170      x      DCMotor::DCMotor(MIOSPWM*) + 7c hex
00004190      x      x      DCMotor::PeriodicFunc(void) + 1c hex
000041d4      x      DCMotor::PeriodicFunc(void) + 60 hex
```



000041e0	x	DCMotor::InitCold(void) + 8 hex
00004278	x	QSMCM::QSMCM(unsigned + 70 hex)
00004284	x	QSMCM::PeriodicFunc(void) + 8 hex
00004348	x	QSMCM::InitCold(void) + c0 hex
0000438c	x	QSMCM::GetBaseAddress(void) + 10 hex
000043f0	x	QSMCM::SetupForQSPI(void) + 60 hex
00004494	x	QSMCMQSPIIIO::QSMCMQSPIIIO(QSMCM*,int,char*) + 88 hex
000044c0	x	QSMCMQSPIIIO::PeriodicFunc(void) + 28 hex
000044d8	x	QSMCMQSPIIIO::PeriodicFunc(void) + 40 hex
000044f8	x	QSMCMQSPIIIO::PeriodicFunc(void) + 60 hex
00004514	x	QSMCMQSPIIIO::PeriodicFunc(void) + 7c hex
000045c8	x	QSMCMQSPIIIO::PeriodicFunc(void) + 130 hex
00004624	x	QSMCMQSPIIIO::PeriodicFunc(void) + 18c hex
00004718	x	QSMCMQSPIIIO::InitCold(void) + 20 hex
000047b0	x	QSMCMQSPIIIO::InitCold(void) + b8 hex
00004804	x	QSMCMQSPIIIO::RegisterIIO(IndexedIO*) + 20 hex
00004830	x	DataObject::DataObject(void) + 28 hex
00004848	x	DataObject::DataObject(void) + 40 hex
00004f8c	x	Device::Device(void) + 64 hex
000050c8	x	Device::ColdInitDone(void) + 10 hex
00005134	x	IIO::IIO(void) + 40 hex
00005140	x	IioEntry::IioEntry(void) + 8 hex
00005180	x	IioEntry::SaveData(unsigned + 24 hex)
000051c8	x	IioEntry::GetData(unsigned + 28 hex)
0000520c	x	IndexedIO::IndexedIO(void) + 40 hex
00005240	x	IndexedIO::AddEntry(int,int,unsigned + 30 hex)
00005290	x	IndexedIO::AddEntry(int,int,unsigned + 80 hex)
000052b0	x	IndexedIO::SetOutData(int,int,unsigned + 1c hex)
000053b4	x	fabs(double) + 1c hex
000053c4	x	fabs(double) + 2c hex
000053ec	x	modf(double,double*) + 24 hex
00005478	x	modf(double,double*) + b0 hex
000054d8	x	ControlProcess::ControlProcess(void) + 5c hex
000054fc	x	ControlProcess::Init(void) + 20 hex
00005568	x	ControlProcess::Init(void) + 8c hex
000055b0	x	ControlProcess::Init(void) + d4 hex
000055d8	x	ControlProcess::Init(void) + fc hex
00005634	x	ControlProcess::Init(void) + 158 hex
00005640	x	ControlProcess::Init(void) + 164 hex
00005678	x	ControlProcess::Init(void) + 19c hex
0000569c	x	ControlProcess::Init(void) + 1c0 hex
00005928	x	ControlProcess::Init(void) + 44c hex
00005960	x	ControlProcess::Init(void) + 484 hex
0000596c	x	ControlProcess::Init(void) + 490 hex
000059c8	x	ControlProcess::Init(void) + 4ec hex
00005a04	x	ControlProcess::Init(void) + 528 hex
00005a40	x	ControlProcess::Init(void) + 564 hex
00005a84	x	ControlProcess::Init(void) + 5a8 hex
00005ab4	x	ControlProcess::PeriodicFunc(void) + 2c hex
00005af4	x	ControlProcess::PeriodicFunc(void) + 6c hex
00005b24	x	ControlProcess::PeriodicFunc(void) + 9c hex
00005b90	x	ControlProcess::PeriodicFunc(void) + 108 hex
00005bac	x	ControlProcess::PeriodicFunc(void) + 124 hex
00005be0	x	..LL78 + 30 hex
00005c10	x	..LL78 + 60 hex
00005c54	x	..LL78 + a4 hex
00005c5c	x	..LL78 + ac hex
00005c6c	x	..LL78 + bc hex
00005ca4	x	..LL78 + f4 hex
00005d0c	x	..LL78 + 15c hex
00005d28	x	..LL78 + 178 hex
00005d68	x	..LL97 + 3c hex
00005d98	x	..LL97 + 6c hex
00005e1c	x	..LL97 + f0 hex
00005e38	x	..LL97 + 10c hex
00005e70	x	..LL107 + 34 hex
00005e84	x	..LL107 + 48 hex
00005ecc	x	..LL107 + 90 hex
00005ee0	x	..LL107 + a4 hex



00005f04	x	x	..LL107 + c8 hex
00005f10	x	x	..LL107 + d4 hex
00005f2c	x	x	..LL107 + f0 hex
00005f6c	x	x	..LL107 + 130 hex
00005f80	x	x	..LL107 + 144 hex
00005fa8	x	x	..LL107 + 16c hex
00005fb4	x	x	..LL107 + 178 hex
00005ff0	x	x	..LL107 + 1b4 hex
00006000	x	x	STACKSIZE + 0 hex
00006014	x		STACKSIZE + 14 hex
00006058	x	x	STACKSIZE + 58 hex
00006070	x	x	STACKSIZE + 70 hex
00006128		x	STACKSIZE + 128 hex
00006130	x		STACKSIZE + 130 hex
00006144	x	x	STACKSIZE + 144 hex
00006150	x	x	STACKSIZE + 150 hex
00006164	x		STACKSIZE + 164 hex
000061c0		x	STACKSIZE + 1c0 hex
000061dc	x		STACKSIZE + 1dc hex
000061f0	x	x	..LL152 + 10 hex
000061fc	x		..LL152 + 1c hex
00006214	x	x	..LL152 + 34 hex
00006220	x		..LL152 + 40 hex
000063c4		x	..LL152 + 1e4 hex
000063e0	x		..LL152 + 200 hex
00006408	x		..LL170 + 24 hex
000064e0	x	x	..LL170 + fc hex
000064ec	x	x	..LL170 + 108 hex
00006524	x		..LL170 + 140 hex
0000654c	x	x	..LL170 + 168 hex
00006554	x	x	..LL170 + 170 hex
00006560	x	x	..LL170 + 17c hex
0000656c	x		..LL170 + 188 hex
00006598	x		..LL170 + 1b4 hex
00006600	x	x	..LL170 + 21c hex
0000666c	x		..LL170 + 288 hex
000066e4	x		..LL170 + 300 hex
00006744	x		..LL170 + 360 hex
000067c4	x	x	..LL170 + 3e0 hex
00006820	x	x	..LL170 + 43c hex
00006884	x	x	..LL170 + 4a0 hex
00006898	x		..LL170 + 4b4 hex
000068c4	x	x	..LL170 + 4e0 hex
000068d8	x		..LL170 + 4f4 hex
000068f4	x	x	..LL170 + 510 hex
00006910	x		..LL170 + 52c hex
00006944	x	x	..LL170 + 560 hex
00006958	x		..LL170 + 574 hex
00006978		x	..LL170 + 594 hex
00006984	x		..LL170 + 5a0 hex
00006994		x	..LL170 + 5b0 hex
000069a0	x		..LL170 + 5bc hex
00006a4c	x	x	..LL170 + 668 hex
00006a58	x	x	..LL170 + 674 hex
00006acc	x	x	..LL170 + 6e8 hex
00006ad8	x	x	..LL170 + 6f4 hex
00006b30	x	x	..LL170 + 74c hex
00006b4c	x	x	..LL170 + 768 hex
00006b6c	x	x	..LL170 + 788 hex
00006bec	x	x	..LL170 + 808 hex
00006c5c	x	x	..LL170 + 878 hex
00006c6c	x	x	..LL170 + 888 hex
00006ccc	x	x	..LL170 + 8e8 hex
00006ce4	x	x	..LL170 + 900 hex
00006cf4	x	x	..LL170 + 910 hex
00006d60	x	x	..LL170 + 97c hex
00006d8c	x		..LL170 + 9a8 hex
00006e2c	x	x	..LL170 + a48 hex
00006e84	x	x	..LL170 + aa0 hex



000070c8	x	..LL170 + ce4 hex
0000728c	x	x priority_enq + 8 hex
000072a4	x	priority_enq + 20 hex
000072cc	x	priority_enq + 48 hex
000072f4	x	priority_enq + 70 hex
00007300	x	priority_enq + 7c hex
00007324	x	__mw_register_ctor + 14 hex
0000736c	x	__mw_register_ctor + 5c hex
00007490	x	__mw_cpp_init + 28 hex
0000749c	x	__mw_cpp_init + 34 hex
000074a8	x	x __mw_cpp_init + 40 hex
000074bc	x	__mw_cpp_init + 54 hex
0000752c	x	_main + 0 hex
00007574	x	operator + 1c hex
000075a4	x	operator + 4c hex
000075e0	x	puts + 20 hex
000075f4	x	puts + 34 hex
0000760c	x	puts + 4c hex
0000936c	x	atexit + 10 hex
0000937c	x	x atexit + 20 hex
000093ac	x	atexit + 50 hex
000095d0	x	_initcopy + 1c hex
000095ec	x	_initcopy + 38 hex
00009600	x	_initcopy + 4c hex
00009610	x	_initcopy + 5c hex
0000963c	x	_initcopy + 88 hex
00009668	x	_initcopy + b4 hex
00009678	x	_initcopy + c4 hex
0000968c	x	_initcopy + d8 hex
000096ac	x	x _initcopy + f8 hex
000096d8	x	x _initcopy + 124 hex
000096e4	x	_initcopy + 130 hex
000096fc	x	_initcopy + 148 hex
00009714	x	_initcopy + 160 hex
00009758	x	x bucket_for + 4 hex
00009760	x	x bucket_for + c hex
00009768	x	bucket_for + 14 hex
0000979c	x	bucket_for + 48 hex
000097ac	x	bucket_for + 58 hex
000097b4	x	x bucket_for + 60 hex
000097c4	x	bucket_for + 70 hex
000097d4	x	bucket_for + 80 hex
000097dc	x	bucket_for + 88 hex
000097ec	x	x bucket_for + 98 hex
000097f4	x	x bucket_for + a0 hex
00009804	x	bucket_for + b0 hex
00009814	x	x bucket_for + c0 hex
0000981c	x	bucket_for + c8 hex
00009824	x	bucket_for + d0 hex
0000982c	x	bucket_for + d8 hex
0000983c	x	bucket_for + e8 hex
00009d50	x	x search_free_chain + 2c hex
00009d64	x	search_free_chain + 40 hex
00009e30	x	search_free_chain + 10c hex
00009e58	x	x search_free_chain + 134 hex
00009e74	x	search_free_chain + 150 hex
00009f88	x	remove_from_free_chain + 20 hex
00009fb0	x	add_to_free_chain + 24 hex
00009ffc	x	add_to_free_chain + 70 hex
0000a010	x	x add_to_free_chain + 84 hex
0000a05c	x	add_to_free_chain + d0 hex
0000a0c0	x	add_to_free_chain + 134 hex
0000a20c	x	set_malloc_level + 20 hex
0000a288	x	set_malloc_level + 9c hex
0000a2c4	x	init_malloc + 38 hex
0000a32c	x	x init_malloc + a0 hex
0000a340	x	init_malloc + b4 hex
0000a36c	x	alloc_segment + 28 hex
0000a374	x	alloc_segment + 30 hex



0000a3a0	x	alloc_segment + 5c hex
0000a3c0	x	alloc_segment + 7c hex
0000a3d0	x	alloc_segment + 8c hex
0000a40c	x	alloc_segment + c8 hex
0000a430	x	alloc_segment + ec hex
0000a438	x	alloc_segment + f4 hex
0000a468	x	alloc_segment + 124 hex
0000a4a8	x	alloc_segment + 164 hex
0000a4d4	x	alloc_segment + 190 hex
0000a4fc	x	malloc + 24 hex
0000a514	x	malloc + 3c hex
0000a544	x	malloc + 6c hex
0000a558	x	malloc + 80 hex
0000a584	x	malloc + ac hex
0000a594	x	malloc + bc hex
0000a5a0	x	malloc + c8 hex
0000a5c0	x	malloc + e8 hex
0000a5cc	x	malloc + f4 hex
0000a5f0	x	malloc + 118 hex
0000a60c	x	malloc + 134 hex
0000a614	x	malloc + 13c hex
0000a630	x	malloc + 158 hex
0000a644	x	malloc + 16c hex
0000a690	x	malloc + 1b8 hex
0000a718	x	malloc + 240 hex
0000a734	x	malloc + 25c hex
0000a75c	x	malloc + 284 hex
0000a784	x	malloc + 2ac hex
0000adf8	x	memcpy + 10 hex
0000ae00	x	memcpy + 18 hex
0000ae0c	x	memcpy + 24 hex
0000ae68	x	memcpy + 80 hex
0000aeb4	x	memcpy + cc hex
0000aed4	x	memcpy + ec hex
0000aedc	x	memcpy + f4 hex
0000af44	x	memcpy + 15c hex
0000af50	x	memcpy + 168 hex
0000afe0	x	memcpy + 1f8 hex
0000b008	x	memcpy + 220 hex
0000b010	x	memcpy + 228 hex
0000b070	x	memcpy + 288 hex
0000b07c	x	memcpy + 294 hex
0000b08c	x	memchr + c hex
0000b098	x	memchr + 18 hex
0000b0a8	x	memchr + 28 hex
0000b0b0	x	memchr + 30 hex
0000b180	x	strcpy + 8 hex
0000b1bc	x	strcpy + 44 hex
0000b220	x	strcpy + a8 hex
0000b22c	x	strcpy + b4 hex
0000b390	x	strlen + 3c hex
0000b3ac	x	getenv + 18 hex
0000b3bc	x	getenv + 28 hex
0000b3d8	x	getenv + 44 hex
0000b3e8	x	getenv + 54 hex
0000b3fc	x	getenv + 68 hex
0000b424	x	getenv + 90 hex
0000b43c	x	getenv + a8 hex
0000b464	x	_bzero + c hex
0000b46c	x	_bzero + 14 hex
0000b4a4	x	_bzero + 4c hex
0000b4ac	x	_bzero + 54 hex
0000b4c0	x	_bzero + 68 hex
0000b4cc	x	_bzero + 74 hex
0000b4d0	x	_bzero + 78 hex
0000bf3c	x	fputc + 28 hex
0000bf50	x	fputc + 3c hex
0000bfa4	x	fputs + 3c hex
0000bfbc	x	fputs + 54 hex



0000bfffc	x	fwrite + 24 hex
0000c00c	x	fwrite + 34 hex
0000c018	x	fwrite + 40 hex
0000c028	x	fwrite + 50 hex
0000c038	x	fwrite + 60 hex
0000c080	x	fwrite + a8 hex
0000c090	x	fwrite + b8 hex
0000c0e4	x	fwrite + 10c hex
0000c12c	x	fwrite + 154 hex
0000c134	x	fwrite + 15c hex
0000c17c	x	fwrite + 1a4 hex
0000c25c	x	fwrite + 284 hex
0000c264	x	fwrite + 28c hex
0000c274	x	fwrite + 29c hex
0000c284	x	fwrite + 2ac hex
0000c298	x	fwrite + 2c0 hex
0000c2c8	x	fwrite + 2f0 hex
0000eff0	x	_finit + 20 hex
0000f01c	x	_finit + 4c hex
0000f028	x	_finit + 58 hex
0000f050	x	_finit + 80 hex
0000f060	x	_finit + 90 hex
0000f068	x	_finit + 98 hex
0000f078	x	_finit + a8 hex
0000f0b0	x	_finit + e0 hex
0000f0f8	x	_finit + 128 hex
0000f10c	x	_stdio_linked + 10 hex
0000f130	x	_fflush + 20 hex
0000f158	x	_fflush + 48 hex
0000f17c	x	_fflush + 6c hex
0000f184	x	_fflush + 74 hex
0000f194	x	_fflush + 84 hex
0000f1a8	x	_fflush + 98 hex
0000f1bc	x	_fflush + ac hex
0000f244	x	_fflush + 134 hex
0000f290	x	setvbuf + 24 hex
0000f2d0	x	setvbuf + 64 hex
0000f2d8	x	setvbuf + 6c hex
0000f2e8	x	setvbuf + 7c hex
0000f300	x	setvbuf + 94 hex
0000f344	x	setvbuf + d8 hex
0000f3a0	x	setvbuf + 134 hex
0000f3d0	x	setvbuf + 164 hex
0000f3e8	x	setvbuf + 17c hex
00010788	x	isatty + c hex
000107a0	x	_brk + 14 hex
00010810	x	sbrk + 14 hex
00010858	x	sbrk + 5c hex
00010884	x	sbrk + 88 hex
00010948	x	init_io + c0 hex
00010954	x	__errno + 8 hex
00010964	x	strlen + c hex
00010974	x	strlen + 1c hex
0001097c	x	strlen + 24 hex
00010998	x	strcpy + 18 hex
0001099c	x	strcpy + 1c hex
000109a0	x	_fss_break + 0 hex
00010b7c	x	open + 70 hex
00010b84	x	open + 78 hex
00010b8c	x	open + 80 hex
00010bb0	x	open + a4 hex
00010ee4	x	write + 34 hex
00010f0c	x	write + 5c hex
00010f14	x	write + 64 hex
00010f78	x	write + c8 hex
00010fb0	x	write + 10c hex
00010fc4	x	write + 114 hex
00010fcc	x	write + 11c hex
00010ff4	x	write + 144 hex



00011718	x	init + 34 hex
----------	---	---------------

2.3.2 Software Code Coverage Metrics

Table 4 shows the percent code coverage logged in the file named ExecutionData.txt. The automatic SW verification tests would typically be extended until 100% coverage is obtained.

Table 4: Software Code Coverage Metrics

Software Code Coverage Metrics
Percent Coverage: 27 Loc Count at ControlProcess::PeriodicFunc(void): 27

2.3.3 Software Interrupt Metrics

Table 5 shows the output of the InterruptData.txt file. These data were generated by setting breakpoints before and after the periodic interrupt processing.

Table 5: Software Interrupt Metrics

Software Interrupt Metrics
Interrupt Period Average: 0.040956 seconds Interrupt Processing Average: 0.027087 seconds Reserve Processing Percent: 33.862628 percent

2.3.4 Software Execution Marker Metrics

These data shows how many times an instruction at a location has been executed. All PowerPC instructions are 4 bytes so this data could be compressed somewhat. Table 6 presents an excerpt from the ExecMark.dat file.

Table 6: Software Execution Marker Metrics

Software Execution Marker Metrics
memcpy
ade8 5
ade9 5
adea 5
adeb 5
adec 5
aded 5
adee 5
adef 5
adf0 5



Software Execution Marker Metrics

adf1	5
adf2	5
adf3	5
adf4	5
adf5	5
adf6	5
adf7	5
adf8	5
adf9	5
adfa	5
adfb	5
adfc	4
adfd	4
adfe	4
adff	4

2.3.5 Software Subroutine & Interrupt Call Metrics

Table 7 presents excerpts from the file named InstrLog.txt showing all subroutine and interrupt calls made during program execution. These data are useful for analyzing and debugging program control flow.

Table 7: Software Subroutine & Interrupt Call Metrics

Software Subroutine & Interrupt Call Metrics

Initial Start

```
0.220131 213c bl -> 000021b0 [_os_startup_hook]
0.220131 21b0 bclr _os_startup_hook
0.220131 2140 bl -> 000021b0 [_os_startup_hook]
0.220132 21b0 bclr _os_startup_hook
0.220133 2158 bl -> 000095b4 [_initcopy]
0.220144 96b8 bl -> 0000ade8 [memcpy]
0.221552 b07c bclr
0.221556 9704 bl -> 0000b458 [_bzero]
0.221740 b4ac bclr
0.221743 9704 bl -> 0000b458 [_bzero]
0.221751 b4ac bclr
0.221754 96b8 bl -> 0000ade8 [memcpy]
0.221761 b07c bclr
0.221765 9704 bl -> 0000b458 [_bzero]
0.221769 b4d0 bclr
0.221772 96b8 bl -> 0000ade8 [memcpy]
0.221780 b07c bclr
0.221784 96fc bclr
0.221786 216c bl -> 0001078c [_brk]
0.221787 107a0 bclr
0.221787 2170 bl -> 00010888 [init_io]
0.221791 108b8 bl -> 00010b0c [_open]
0.221794 10b40 bl -> 00010958 [strlen]
0.221808 1097c bclr
0.221810 10b64 bl -> 00010980 [strcpy]
0.221824 1099c bclr
0.221824 10b68 bl -> 000109a0 [_fss_break]
0.221824 109a0 bclr _fss_break
. . .
```



Software Subroutine & Interrupt Call Metrics

More Initialization

```
0.222832 2188 bl -> 0000935c [atexit]
0.222837 93ac bclr
0.222838 2198 bl -> 000035d0 [main]
0.222839 35e0 bl -> 0000752c [_main]
0.222839 752c bclr _main
0.222842 360c bl -> 00002f30 [InitCom(char)]
0.222842 2f6c bclr
0.222842 3614 bl -> 00002f30 [InitCom(char)]
0.222842 2f6c bclr
0.222842 3628 bl -> 00007558 [operator]
0.222842 7568 bl -> 0000a4d8 [malloc]
0.222843 a500 bl -> 0000a28c [init_malloc]
0.222843 a2a0 bl -> 000107fc [sbrk]
0.222843 10884 bclr
0.222844 a2dc bl -> 0000a1ec [set_malloc_level]
0.222844 a200 bl -> 0000b394 [getenv]
0.222844 b3c4 bl -> 0000b354 [strlen]
0.222844 b378 bl -> 0000b080 [memchr]
0.222847 b0b0 bclr
0.222847 b390 bclr
0.222847 b3e0 bl -> 0000b354 [strlen]
0.222847 b378 bl -> 0000b080 [memchr]
0.222851 b0b0 bclr
0.222851 b390 bclr
0.222851 b43c bclr
0.222851 a288 bclr
0.222853 a340 bclr
0.222854 a578 bl -> 00009d24 [search_free_chain]
0.222854 9d3c bl -> 00009754 [bucket_for]
0.222854 97dc bclr
0.222857 9e74 bclr
0.222857 a628 bl -> 0000a344 [alloc_segment]
0.222857 a360 bl -> 000107fc [sbrk]
. . .
```

A Device Interrupt Occurs

```
0.326255 32d0 bl -> 000030c8 [SerialReady(char)]
0.326255 30d8 bl -> 00002f70 [ClearWatchdog(void)]
0.326255 2f90 bclr
0.326255 3118 bclr
0.326255 32d0 bl -> 000030c8 [SerialReady(char)]
0.326256 30cc interrupt
0.326256 2084 bcctrl -> 000040d4 [HandleISR]
0.326257 40e0 bl -> 00002d2c [static]
0.326262 2ddc bl -> 00002b20
[RealTimeObject::CallFunctionIndirect(void(RealTimeObject::*)(void))]
0.326262 2b38 bcctrl -> 00002580 [QADC::Queue1_ISR(void)]
0.326262 25a4 bl -> 00002e84 [TimingMonitor::SetBit(int)]
0.326263 2ea8 bclr
0.326279 25fc bl -> 00002eac [TimingMonitor::ResetBit(int)]
0.326279 2ed0 bclr
0.326279 2610 bclr
0.326280 2b48 bclr
0.326280 2e00 bclr
0.326280 40f0 bclr
0.326280 2110 interrupt return
0.326281 30d8 bl -> 00002f70 [ClearWatchdog(void)]
0.326281 2f90 bclr
0.326281 3118 bclr
0.326281 32d0 bl -> 000030c8 [SerialReady(char)]
0.326281 30d8 bl -> 00002f70 [ClearWatchdog(void)]
0.326282 2f90 bclr
. . .
```



Software Subroutine & Interrupt Call Metrics

A Periodic Interrupt Occurs

```
0.298334 3118      bclr
0.298334 32d0      bl  -> 000030c8 [SerialReady(char)]
0.298334 30cc      interrupt
0.298335 20ac      bcctrl -> 000040b4 [ShortPeriodicInt]
0.298335 40c0      bl  -> 00002bf8 [static]
0.298335 2c18      bl  -> 00002e84 [TimingMonitor::SetBit(int)]
0.298335 2ea8      bclr
0.298336 2c48      bl  -> 000029bc [static]
0.298336 29d4      bclr
0.298336 2c4c      bl  -> 000029d8 [static]
0.298336 2a00      bclr
0.298336 2c60      bl  -> 00002ae4

[RealTimeObject::ResetShortPeriodicTaskIterator(void)]
0.298336 2af4      bclr
0.298336 2c68      bl  -> 00002af8 [RealTimeObject::GetNextSPTask(void)]
0.298337 2b1c      bclr
0.298337 2ca0      bl  -> 00002b20

[RealTimeObject::CallFunctionIndirect(void(RealTimeObject::*)(void))]
0.298337 2b38      bcctrl -> 00005a88 [ControlProcess::PeriodicFunc(void)]
0.298462 63e0      bclr
0.298463 63e0      bclr
0.298465 63e0      bclr
0.298466 63e0      bclr
0.298467 63e0      bclr
0.298468 63e0      bclr
0.325406 6e78      bl  -> 00005398 [fabs(double)]
0.325406 53c4      bclr
0.325406 6e94      bl  -> 000053c8 [modf(double,double*)]
0.325407 5478      bclr
0.325408 6edc      bl  -> 00005294 [IndexedIO::SetOutData(int,int,unsigned)
0.325408 52b0      bclr
0.325408 6ef4      bl  -> 00005294 [IndexedIO::SetOutData(int,int,unsigned)
0.325408 52b0      bclr
0.325408 6f0c      bl  -> 00005294 [IndexedIO::SetOutData(int,int,unsigned)
0.325408 52b0      bclr
0.325409 6f28      bl  -> 00005294 [IndexedIO::SetOutData(int,int,unsigned)
0.325409 52b0      bclr
0.325409 6f4c      bl  -> 00005294 [IndexedIO::SetOutData(int,int,unsigned)
0.325409 52b0      bclr
0.325409 6f6c      bl  -> 00005294 [IndexedIO::SetOutData(int,int,unsigned)
0.325410 52b0      bclr
0.325410 6f88      bl  -> 00005294 [IndexedIO::SetOutData(int,int,unsigned)
0.325410 52b0      bclr
0.325410 6fa8      bl  -> 00005294 [IndexedIO::SetOutData(int,int,unsigned)
0.325410 52b0      bclr
0.325411 6fc4      bl  -> 00005294 [IndexedIO::SetOutData(int,int,unsigned)
0.325411 52b0      bclr
0.325411 6fe4      bl  -> 00005294 [IndexedIO::SetOutData(int,int,unsigned)
0.325411 52b0      bclr
0.325411 7000      bl  -> 00005294 [IndexedIO::SetOutData(int,int,unsigned)
0.325412 52b0      bclr
0.325412 7020      bl  -> 00005294 [IndexedIO::SetOutData(int,int,unsigned)
0.325412 52b0      bclr
0.325412 703c      bl  -> 00005294 [IndexedIO::SetOutData(int,int,unsigned)
0.325412 52b0      bclr
0.325412 705c      bl  -> 00005294 [IndexedIO::SetOutData(int,int,unsigned)
0.325413 52b0      bclr
0.325413 7078      bl  -> 00005294 [IndexedIO::SetOutData(int,int,unsigned)
0.325413 52b0      bclr
0.325413 7098      bl  -> 00005294 [IndexedIO::SetOutData(int,int,unsigned)
0.325413 52b0      bclr
0.325414 70c8      bclr
0.325414 2b48      bclr
```



Software Subroutine & Interrupt Call Metrics

```

0.325414 2cb0    bl  -> 00002894 [ShortPeriodicTask::MeasDuration(int)]
0.325414 28c4    bclr
0.325414 2c68    bl  -> 00002af8 [RealTimeObject::GetNextSPTask(void)]
0.325415 2b1c    bclr
0.325415 2c4c    bl  -> 000029d8 [static]
0.325415 2a00    bclr
0.325415 2c60    bl  -> 00002ae4 [RealTimeObject::ResetShortPeriodicTaskIterator(void)]
0.325415 2af4    bclr
0.325415 2c68    bl  -> 00002af8 [RealTimeObject::GetNextSPTask(void)]
0.325415 2b1c    bclr
0.325416 2ca0    bl  -> 00002b20
[RealTimeObject::CallFunctionIndirect(void(RealTimeObject::*)(void))]
0.325416 2b38    bcctrl -> 00004174 [DCMotor::PeriodicFunc(void)]
0.325416 41b4    bl  -> 000023e8 [MIOSPWM::SetDutyCycle(int,unsigned)]
0.325416 2400    bclr
0.325417 41d4    bclr
0.325417 2b48    bclr
0.325417 2cb0    bl  -> 00002894 [ShortPeriodicTask::MeasDuration(int)]
0.325417 28c4    bclr
0.325417 2c68    bl  -> 00002af8 [RealTimeObject::GetNextSPTask(void)]
0.325417 2b1c    bclr
0.325418 2c4c    bl  -> 000029d8 [static]
0.325418 2a00    bclr
0.325418 2c60    bl  -> 00002ae4 [RealTimeObject::ResetShortPeriodicTaskIterator(void)]
0.325418 2af4    bclr
0.325418 2c68    bl  -> 00002af8 [RealTimeObject::GetNextSPTask(void)]
0.325418 2b1c    bclr
0.325419 2ca0    bl  -> 00002b20
[RealTimeObject::CallFunctionIndirect(void(RealTimeObject::*)(void))]
0.325419 2b38    bcctrl -> 00004498 [QSMCMQSPIIIO::PeriodicFunc(void)]
0.325420 452c    bl  -> 0000515c [IioEntry::SaveData(unsigned)]
0.325420 5180    bclr
0.325420 453c    bl  -> 000051a0 [IioEntry::GetData(unsigned)]

```

2.3.6 Software Disassembly

Table 8 gives an excerpt from the Disassembly.txt file. While not technically a metric, this information can be useful to gain a sense of where everything is linked in an embedded program. For all other purposes, disassembly listings from the development environment are superior.

Table 8: Software Disassembly

Software Disassembly

```

2870 mfspr r0,8  [QADC::InitWarm(void)]
2874 stw r0,4(r1)
2878 bclr 20,0
287c mfspr r0,8  [QADC::ContSelfTest(void)]
2880 stw r0,4(r1)
2884 bclr 20,0
2888 mfspr r0,8  [QADC::SelfTest(void)]
288c stw r0,4(r1)
2890 bclr 20,0
2894 mfspr r0,8  [ShortPeriodicTask::MeasDuration(int)]
2898 stw r0,4(r1)
289c lwz r11,30(r3)
28a0 rlwinm r12,r11,2,0,29

```



```
28a4    add r12,r3,r12
28a8    stw r4,10(r12)
28ac    addi r12,r11,#1
28b0    cmpwi 0,r12,#8
28b4    stw r12,30(r3)
28b8    bc 4,2,$+c
28bc    li r12,#0
28c0    stw r12,30(r3)
28c4    bclr 20,0
28c8    mfspr r0,8  [ShortPeriodicTask::GetMeasDurationAvg(void)]
28cc    stw r0,4(r1)
28d0    li r12,#0
28d4    li r10,#0
28d8    cmpwi 0,r10,#8
28dc    bc 4,0,$+1c
28e0    rlwinm r11,r10,2,0,29
28e4    add r11,r3,r11
28e8    lwz r11,10(r11)
28ec    addi r10,r10,#1
28f0    add r12,r11,r12
28f4    b $-1c
28f8    srawi r12,r12,#3
28fc    addze r12,r12
2900    ori r3,r12,#0
2904    bclr 20,0
2908    mfspr r0,8  [RealTimeObject::RealTimeObject(void)]
290c    stw r0,4(r1)
2910    lis r12,#10000
2914    addi r12,r12,#3c48
2918    lis r10,#800000
```